IPC

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Operating instructions

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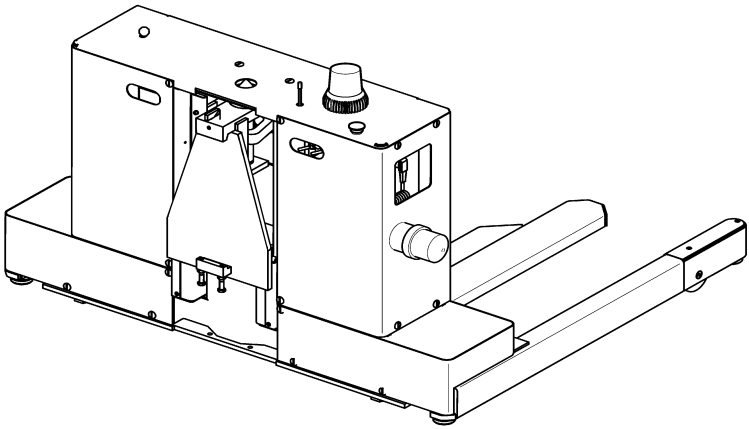

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Foreword

Safe operation of the fork lift truck requires specific knowledge which is imparted by the present operating instructions. The information is presented in concise and clearly laid-out form. The individual chapters are arranged in alphabetical order and every chapter starts with page 1. The individual pages are identified by the chapter letter and the page number.
Example: Page B2 is the second page of chapter B.

Various truck variants are described in these operating instructions. During operation and maintenance work, pay attention that the description appropriate to the truck type is used.

Safety instructions and important notes are identified by the following pictograms:

Used before safety instructions that have to be observed in order to prevent danger to personnel.

Used before notes that have to be observed in order to prevent damage to equipment.

Used before general notes and explanations.

- Used to indicate standard equipment.

- Used to indicate optional equipment.

In the interest of continued development, the manufacturer reserves the right to incorporate modifications (which will not, however, change the essential features of the type of machine described) without updating the present operating instructions at the same time.

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A Correct use and application of the truck

The „Guidelines for the Correct Use and Application of Industrial Trucks“ (VDMA) are included in the scope of delivery for this truck. The guidelines are part of these operating instructions and must always be heeded. National regulations are fully applicable.

The fork lift truck described in these operating instructions is a truck that is suitable for lifting and transporting loads.
It must be used, operated and maintained according to the information in these operating instructions. Any other uses are outside the design envelope and can lead to injury to persons or damage to equipment and property. Above all, overloading caused by excessively heavy or unbalanced loads must be avoided. The max. admissible load to be picked up is indicated on the identification plate or load diagram label shown on the truck. The fork lift truck must not be operated in spaces subject to fire or explosion hazards, or in spaces where corrosive or very dusty atmospheres prevail.

Duties of the user: A „user“ within the meaning of these operating instructions is defined as any natural or legal person who either uses the fork lift truck himself, or on whose behalf it is used. In special cases (e.g. leasing or renting), the user is considered the person, who, in accordance with existing contractual agreements between the owner and the user of the fork lift truck, is charged with the observance of the operating duties.
The user must ensure that the truck is not abused and only used within its design limits and that all danger to life and limb of the operator, or third parties, is avoided. In addition to this, it must be ensured that the relevant accident prevention regulations and other safety-related provisions, as well as the operating, servicing and maintenance guidelines, are observed. The user must also ensure that all persons operating the truck have read and understood these operating instructions.

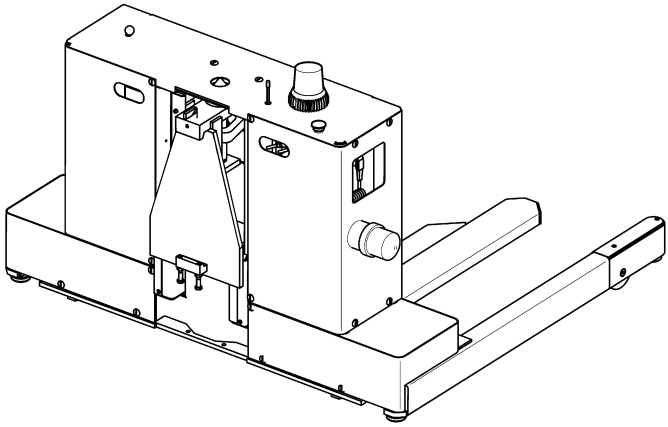
If these operating instructions are not observed the warranty becomes void. The same applies if improper works are carried out at the device by the customer and/or third parties without permission of our Customer Service.

Mounting of attachments: The mounting or installation of any attachments which will interfere with, or supplement, the functions of the truck is permitted only after written approval by the manufacturer has been obtained. If necessary, the approval of local authorities has to be obtained.
Any approval obtained from local authorities does not, however, make the approval by the manufacturer unnecessary.

B Description of the truck

1 Design and Application

The IPC load carriage truck is a forklift attachment used in the Jungheinrich IPC rack for transporting goods on pallets. The fork lift truck to be used must be approved by Jungheinrich for each intended application.

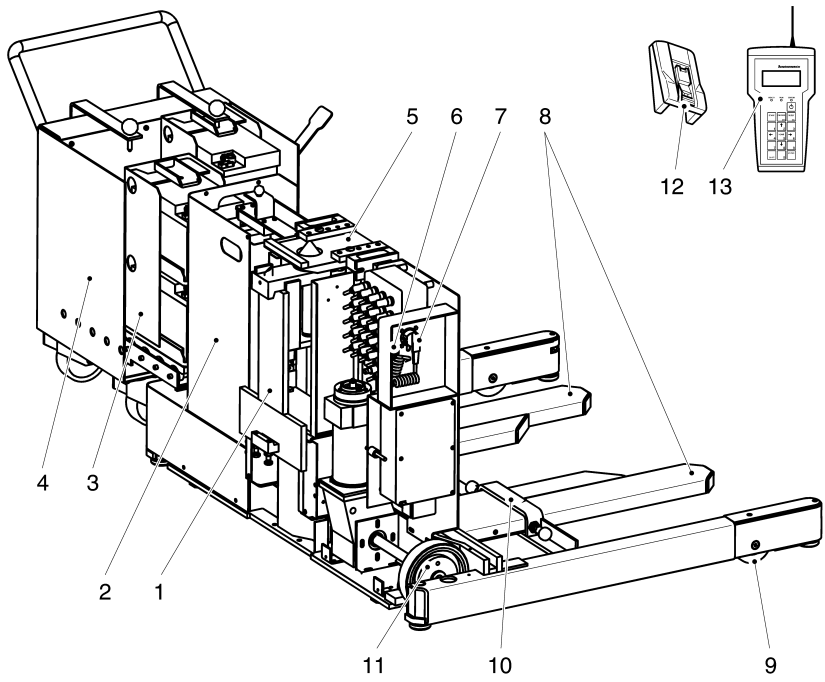


STOP The truck's capacity is reduced due to the increased load centre of gravity. The driver must check the load before lifting it, and if necessary he must check the adjustable pallet stop is positioned correctly (type P5). Overloading will cause the truck to tip over!

⚠ The capacity and load centre of gravity can be taken from the data plate.

➔ The required residual capacity of the truck depends on the truck model and the corresponding load centre of gravity. For IPC operation an additional capacity diagram must be attached to the truck and observed.

The following pallet types may be used for IPC operation: Euro pallets, industrial pallets or a combination of the two.



Item	IPC	Designation
1	●	Truck coupling with locating cone
2	●	Enclosure
3	● / ○	Battery container/changing container
4	○	Battery exchange trolley
5	●	Coupling plate with locating cone
6	●	I/O switch/key switch
7	●	Battery charge plug AC 230 V (integrated charger, 24 V, 9 A)
8	●	Lifting fork
9	●	Load wheel
10	○	Pallet stop, adjustable
11	●	Drive wheel
12	●	Docking station (including charger)
13	●	Hand operating device

● = Series equipment ○ = Optional equipment

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2.1 Truck

Construction: The IPC is a four-wheel vehicle with 2 load wheels and 2 drive wheels that are connected (fixed) via a straight-through shaft. Due to its easily dismountable cover all components are well accessible. The device is operated via a remote radio control from the lift truck.

Safety devices:

– A robust, appropriately dimensioned, and actively controlled locking hook prevents unintended separation of the load carriage from the lift truck.
– Sensors detect guide rail and channel end.
– The redundant distance measurement provides a high safety level when travelling in the channel.
– Mechanical limit stops reliably prevent the load carriage from falling out, even in case of total failure of the control system and the power electronics.

Operating and display instruments: Handy control terminal with bracket for the truck and power supply (docking station) from the truck battery (18 to 60 volts). Can also be used as a hand terminal with a buffer battery.

– Including LCD to display the truck status
– Defined function keys for programmed transport procedure
– Ten-key keypad for special situations
– Service mode

Drive system: Bevel gearing directly seated on drive shaft. CD 24 V, 0.37 kW (KB 60 minutes) traction motor with digital tachometer and thermal sensor.

Lifting drive: Hydraulic unit with pump, tank, and cylinder

Electrical connections: Potential-free operation.

Protection class: IP 65 for connectors, sensors, and housing.

Batteries: 2 x Lead-gel batteries 12 V/60 Ah in series in battery container with automatic contacting.

3 Technical data

Indication of technical data according to VDI 2198. Subject to modification and supplementing.

3.1 Performance data for standard trucks (IPC load carriage)

	Description	IPC	
Q	Rated capacity	1200	kg
C	Load centre of gravity	see chapter 3.3	
	Fwd./rev. travel speed (0.5 m/s)	1,8	km/h
	Lift speed w / w.o. load	0.01 / 0.02	m/s
	Lowering speed w / w.o. load	0.04 / 0.02	m/s
	Net weight of load carriage including battery and coupling	440	kg
	Battery weight	58	kg
	Battery	2 x 12 V / 60 Ah. in series	kg
	Range with a single battery charge (depending on application conditions)	approx. 8 - 10	h
	Truck coupling weight (depending on model)	30	kg
	Motor output	0.37	kW

3.2 Dimensions

	Description	IPC	
l_6	Stacking depth/pallet length	800 - 1200	mm
l_1	Load carriagelength	see chapter 3.3	
b_1	Truck width	940 - 1340	mm
b_4	Width – inside straddle	820 - 1220	mm
b_5	Width across forks	570 - 720	mm
h_8	Outrigger height	122	mm
h_{13}	Lowered fork height	100	mm
e	Fork width	160	mm
s	Fork thickness	50	mm
l	Fork length	see chapter 3.3	
h_1	Height	950	mm
h_3	Lift	80	mm
c_e	Net load centre of gravity	305	mm

3.3 **Truck types / pallet formats** (stacking depth underlined)

Indication of technical data according to VDI 2198

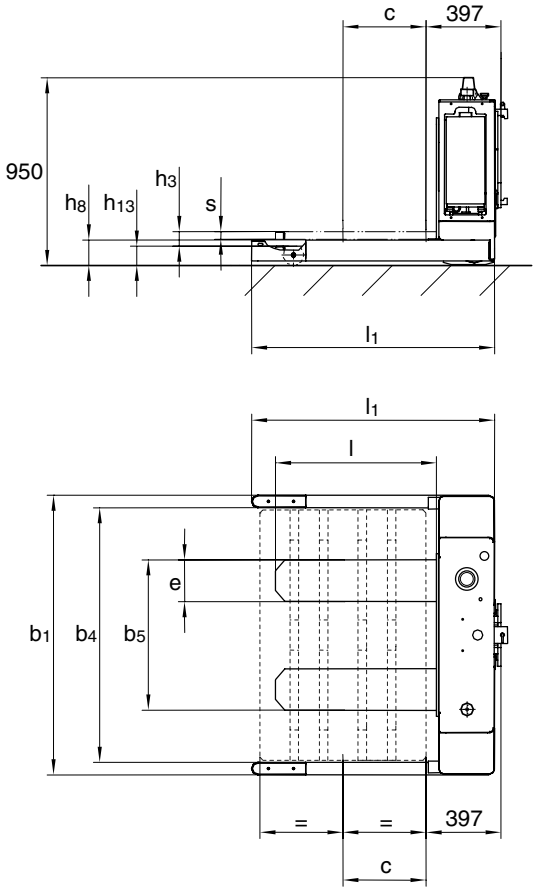
Pallet size	Pallet type	Fork length (l)	Load centre of gravity (c)	Load carriage length (l_1)	Width across forks (b_5)	Overall Width (b_1)
800 x 1200 (P1)	EURO crosswise	780	400	1177	720	1340
1000 x 1200 (P2)	INDU crosswise	980	500	1377	720	1340
1200 x 800 (P3)	EURO lengthwise	1180	600	1577	570	940
1200 x 1000 (P4)	INDU lengthwise	1180	600	1577	570	1140
800 x 1000 x 1200 (P5)	EURO / INDU crosswise (switchable)	980	500 / 600[1]	1377	720	1340

[1] c = 600 mm for Euro pallet l_6 = 800 mm, as it includes the fork tips

Load devices:

Use of the IPC load carriage is permitted for undamaged and specified pallets only. Refer to the “IPC order data” enclosed with the truck documents in case of deviating dimensions.

Significant function restrictions and dangers can result from non-observance of these stipulations. Warranty shall be void in these cases.


c
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c

3.4 EN standards

Continuous sound level: 66 dB(A)

according to prEN 12053 as stipulated in ISO 4871

The continuous sound level is a value averaged according to standard regulations, taking the sound pressure level into account when driving, lifting and idling. The sound pressure level is measured at the ear.

Electromagnetic compatibility (EMC)

The manufacturer confirms compliance with the limit values for electromagnetic emission and interference immunity as well as testing of static electricity discharge according to prEN 12895 and the references to other standards contained therein.

Electrical or electronic components and their arrangement may only be modified after written approval by the manufacturer has been obtained.

3.5 Conditions for application

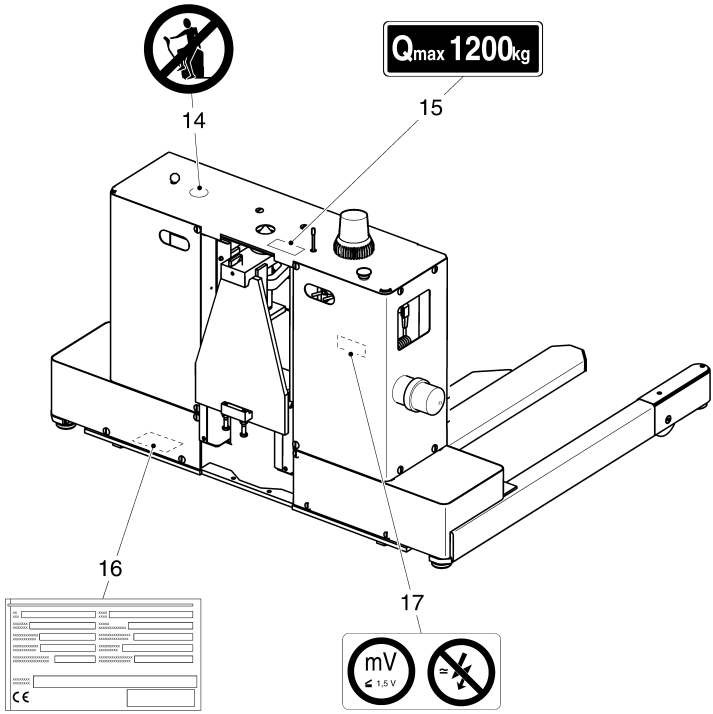
Standard version: in operation 0°C to 40°C
24 h average max. 25°C

Industrial trucks must be specially equipped and approved for continuous use in environments with temperatures below 5°C or in cold stores respectively with extreme temperatures or humidity changes.

Cold-store version: in operation -30°C to 0°C
Operating mode 4, trucks that generally remain in the cold store during operation and only briefly leave it to transfer loads, but not including shock freezer operation (Technical Group Guidline 1006 of 04.09.2002).
No cold-warm change (formation of hoar-frost)

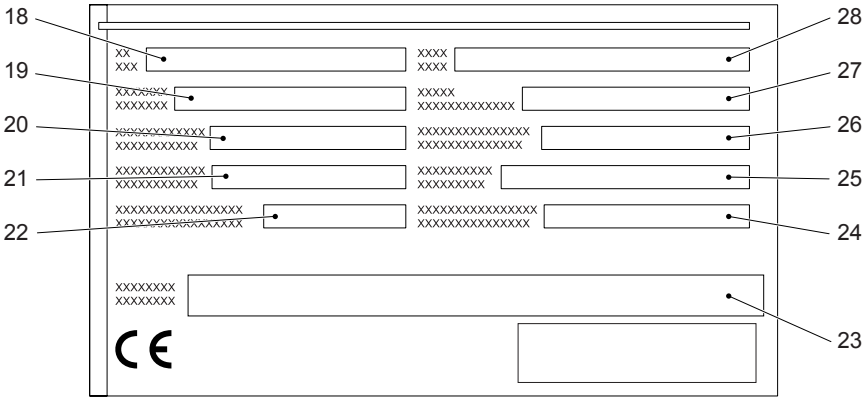
Allow the truck to dry completely before you enter the cold store area. Batteries are always charged outside the freezer area.
The truck must be removed from the freezer zone for operating intervals of more than 30 minutes. When switched off, the truck must always be parked outside the freezer zone.

4 Label positions and identification plates



Item	Designation
14	Warning label “No passengers allowed”
15	Capacity
16	Truck identification plate
17	Warning label “CAUTION: Low-voltage electronics”

4.1 Truck identification plate

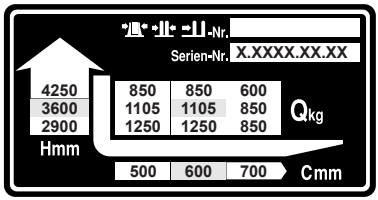


Item	Designation	Item	Designation
18	Type	24	Min./max. battery weight in kg
19	Serial No. (truck No.)	25	Output kW
20	Rated capacity in kg	26	Load centre distance in mm
21	Battery: Voltage V Ampere hours Ah	27	Year of manufacture
22	Net weight without battery	28	Option, e.g. TK
23	Manufacturer		

For queries relating to the truck or spare parts orders, please state the model reference (18) and truck serial no. (19).

4.2 Capacity Plate

An additional capacity chart must be attached to the carrying truck so that it is visible to the driver.



The capacity plate gives the capacity (Q) of the truck in kg with a vertical mast. The maximum capacity is shown as a table with a standard load centre of gravity distance * C (26, in mm) and the required lift height H (in mm).

* The standard load centre of gravity distance takes into account the width as well as the height of the load.

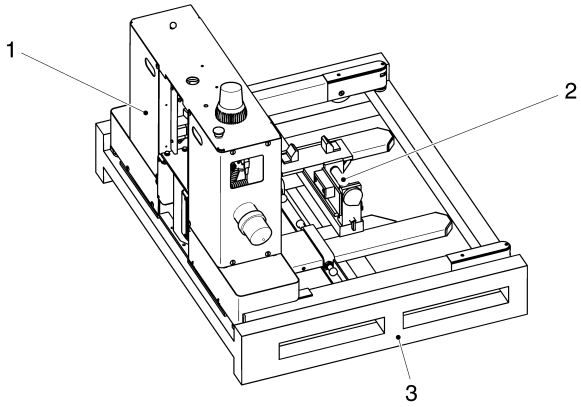
Example of how to calculate the maximum capacity:

With a load centre of gravity distance C of 600 mm and a maximum lift height H of 3600 mm. the max. capacity Q is 1105 kg.

C Transportation and commissioning

1 Loading on lift trucks

⚠ Use only fork lift trucks with sufficient carrying capacity and position the load lifting device with the wheel arm tips pointing away from the lift truck. (transport weight=550 kg incl. pallet and lift truck coupling, without attachments)



➔ The vehicle (1) is delivered on a special shipping rack (3) that also contains the lift truck coupling (2).

Put the vehicle down on level surface, loosen the lashing straps.

2 Mounting the docking station at the lift truck

As power supply and fixture for the hand operating unit a docking station must be mounted at the fork lift truck.

⚠ Observe all maintenance safety instructions (refer to chapter F) and the documentation for the fork lift truck when mounting and connecting the device.

Mounting in the visual and reaching range of the driver, e. g. at the holder of the overhead guard. (mounting bracket not included in the scope of delivery)

Electrical connection (only by authorised specialists!)
Supply voltage: DC 16-48 V, fuse: 2 A, continues supply, if possible.
Connecting cable (2 m) included.

Plug/cable assignment: 1 brown (+); 3 blue (-)

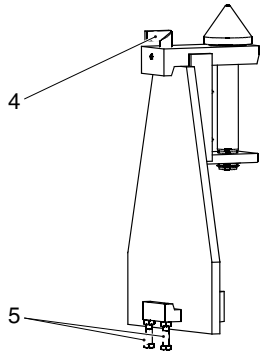
⚠ Voltage peaks that damage the docking station occur in lift trucks with thyristor control. A filter or DC/DC converter must be connected upstream in these device.

3 Commissioning

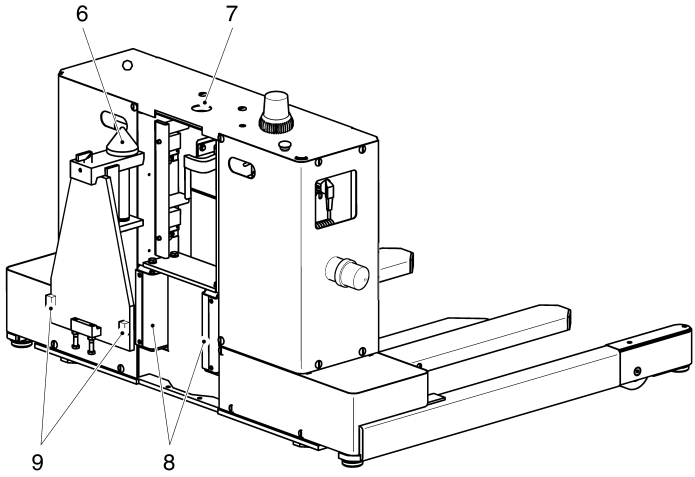
⚠ Only drive the truck with the battery container installed. Do not drive with trailing cable!

In order to prepare the truck for work following delivery or transportation, the following operations must be performed:

– Check the truck for completeness and satisfactory condition of the equipment.
– If required, install the battery and make sure not to damage the battery cable and connector.
– Charge the battery (refer to chapter D).
– Mount the lift truck coupling to the FEM fork carrier of the fork lift approved for this purpose; lift snap-lock bar (4) and lock in lifted position. Slide the coupling centrically onto the FEM fork carrier, allow snap-lock bar to latch in the centre latch position. Tighten the lower adjusting screws (5) and counter-lock.



– The receptacle cone (6) and the centring pieces (9) of the truck coupling or the receptacle plate (7) and the wear plates (8) on the load carriage must be lubricated before commissioning (e.g. multi-purpose grease or a good adhesive Molykote grease, if necessary de-wax before lubricating).



– Bring the truck into service as prescribed (refer to chapter E).

⚠ When the truck is parked, the running surfaces of the tyres may flatten. The flattening will disappear after a short operating time of the truck.

D Battery - Servicing, recharging, replacement

1 Safety regulations governing the handling of lead-acid batteries

The truck must be parked and rendered safe before any operations on batteries are undertaken (refer to chapter E).

Servicing staff: Recharging, servicing and replacing of batteries must only be performed by qualified personnel. The instructions contained in this operating manual, and the instructions of the manufacturer of the battery and of the battery recharging station, must be observed when performing the above operations.

Fire protection measures: Smoking and naked flames are not permitted when handling batteries. No inflammable substances or spark-generating materials must be present or stored within a distance of 2 meters of the truck parked for battery recharging. The location must be well ventilated and fire fighting equipment must be kept ready.

Servicing of batteries: The battery cell screw caps must be kept dry and clean. Terminals and cable shoes must be clean, lightly greased with pole grease and must be securely tightened. Batteries with bare terminal posts must be covered using a non-skid insulating mat.

Disposal of the battery: Batteries must only be disposed of as stipulated in the national environmental protection regulations or waste disposal provisions. The manufacturer's specifications for the disposal must be heeded.

Before closing the battery hood, make sure that the battery cable cannot be damaged.

Batteries contain dissolved acid which is toxic and caustic. For this reason, protective clothing and goggles must be worn whenever work is undertaken on batteries. Avoid physical contact with battery acid.
If clothing, skin or eyes accidentally come into contact with battery acid, liberally flush the affected parts with clean water. Consult a doctor when skin or eyes come into contact with battery acid. Spilled battery acid must be immediately neutralized.

Only batteries with closed tray may be used.

Battery weight and dimensions have considerable influence on operational safety of the truck. Changing the battery equipment is not permitted without prior approval by the manufacturer.

2 Battery types

⚠ The vehicle is equipped with maintenance-free battery types (refer to chapter B 3.1). You must not refill distilled water into these battery types. The cell covers are tightly closed. Opening the covers will destroy the battery!

The battery weights can be seen on the battery identification plate.

3 Battery charge condition

The battery charge condition is detected via the control system and is indicated at the hand operating unit.

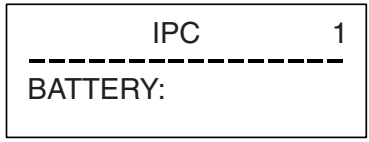
The following conditions are possible:

Charging condition	Red LED	Vehicle function
30% - 100%	off	full function
20% - 30%	flashing	full function
below 20%	flashing	no longer accepts travel orders

➔ When the red LED starts flashing, the vehicle can still be operated for approximately 1 hour. To achieve a longer service life, however, the battery should not be discharged exhaustively.

The current battery voltage can be directly displayed at the hand operating unit; press the ➞ key to scroll once to the right:

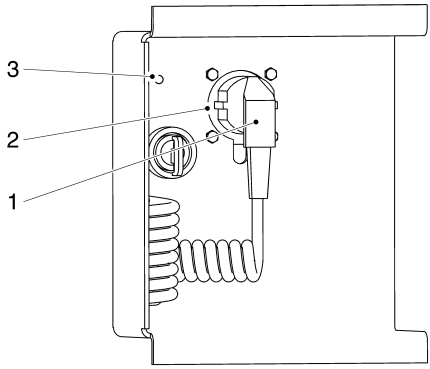
Menu:



4 Charging the battery with AC 230 V

The mains cable of the charger can be accessed from the outside.

– Switch off the truck at the key switch.
– Remove the mains plug (1) from its receptacle (2) at the charger and plug into a suitable mains socket (230 V ± 10%). The LED (3) flashes green and indicates that the charger is connected to mains and that the charging operation is active.
– Charge the battery until the LED (3) lights up green continuously.
– Unplug the plug (1) from mains and insert it into the receptacle of the safety switch at the truck (2).



Mains connection:
Mains voltage: 230 V ± 10%
Mains frequency: 50 Hz ± 4%

All electrical functions are disconnected during the charging operation (electronic move protection). The truck cannot be operated.

Charging times

The charging time can take up to 8 hours depending on the battery discharge status.

Trickle charge

After a few hours the charger then switches to a compensation charge. Charging, including the trickle charge, lasts up to 40 hours and is completed when the connector is removed. Trickle charging, for example at the weekend, increases the battery's useful life.

Partial charging

The charger automatically adapts to the current charge status when connected to a partially charged battery. This keeps battery wear to a minimum.

A red flashing LED (3) means that the battery is faulty or the charge current circuit has been interrupted.

5 Changing the battery

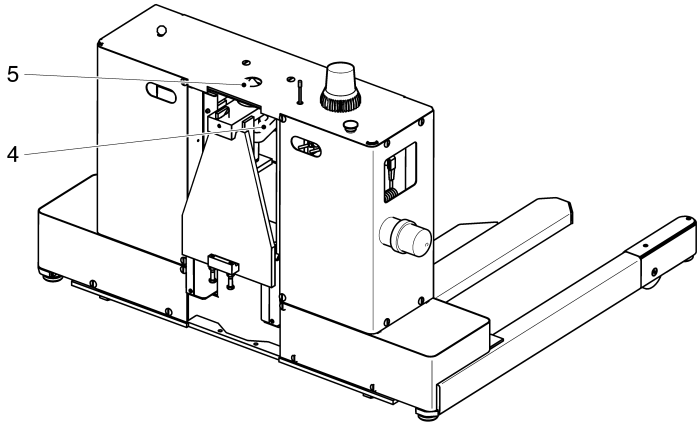
For multi-shift operation as well as for cold-store usage the battery can be changed.

Battery change trolleys with integrated charger and additional battery containers are available as accessories.

For changing the battery the load carriage must be standing on level surface and there must be approx. 1.5 m free space at the battery side and approx. 0.5 m to the lift truck.

Load carriage is coupled and switched on:

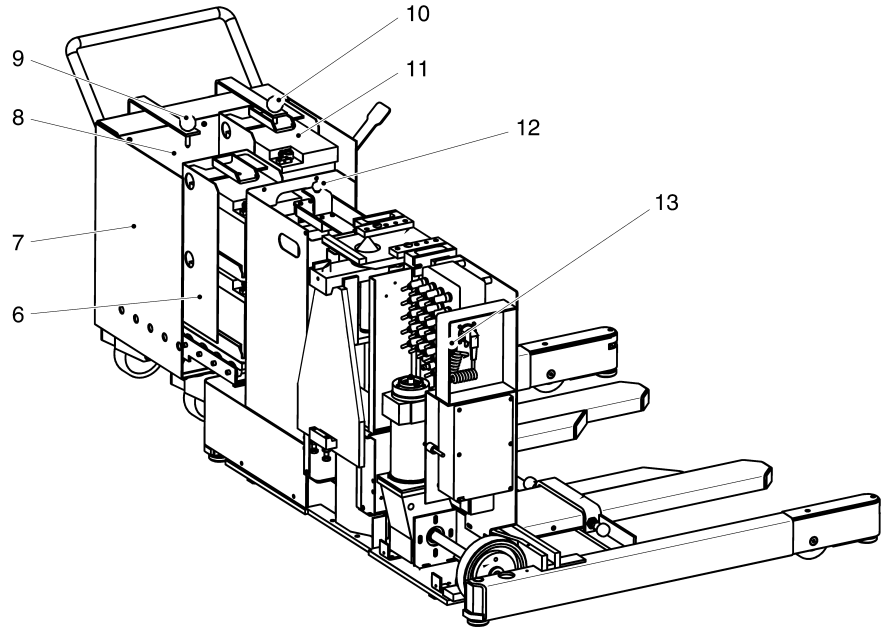
- Lower the mast until the load carriage almost reaches the ground (same as for picking up a pallet from the ground).
- Press “Start” at the hand operating unit, the locking mechanism (4) opens.
- Lower the mast until cone (5) is free.
- Reverse the lift truck by approx. 0.5 m.



– Switch off the load carriage at the key switch (13).
– Approach the battery change trolley (7) with the empty compartment (8) to the battery compartment of the load carriage and center it.
– Pull up the locking knob (12).
– Pull the battery container (6) from the load carriage onto the change trolley.

STOP Secure the battery container (6) with the locking knob (9)!

– Shift the change trolley so that the charged battery is located at the battery compartment of the load carriage.
– Pull up locking knob (10) and push the charged battery container (11) into the load carriage while pulling up the locking know (12) 10 cm in front of the stopping point and releasing it when the battery container is at the limit stop. The battery make contact automatically.



⚠ To lock the battery container correctly in place, the locking knob (12) must slide down completely (flush with the truck covering) after completely pushing the battery container into the truck.

Check correct locking!

STOP If the battery container is not locked correctly it may roll out and fall down when lifted by the truck.

– Switch on the load carriage at the key switch (13).
– Pick up the load carriage with the lift truck, the lock automatically closes after docking.

E Operation

1 Safety regulations governing the operation of the fork lift truck (IPC load carriage)

Driving permission: The fork lift truck must only be operated by persons who have been trained in the operation of trucks, who have demonstrated to the user or his representative their capability of moving and handling loads, and who have expressly been charged by the user or his representative with the operation of the truck.

Rights, duties and conduct of the driver: The driver must be: informed of his rights and duties; trained in the operation of the fork lift truck; and familiar with the contents of these operating instructions. All necessary rights must be granted to him.
If the fork lift truck can be used in the pedestrian-controlled mode, the driver must wear safety boots when operating the truck.

Prohibition of unauthorised use: The driver is responsible for the fork lift truck during working time. He must forbid unauthorised persons to drive or operate the fork lift truck. The transport or lifting of persons is forbidden.

Damage and defects: Damage or defects noted on the fork lift truck or on the attachments must immediately be brought to the notice of the person in charge. fork lift trucks that cannot be safely operated (e.g. due to worn tyres or defective brakes) must not be used until they have been properly repaired.

Repairs: Without specific training and express authorisation, the driver is not allowed to perform any repairs or modifications on the fork lift truck. Under no circumstances must the driver change the setting of switches or safety installations or render them ineffective.

Danger area: A “danger area” is considered to be the area within which persons are endangered by the travelling or lifting movements of the fork lift truck or its load lifting devices (e.g. fork or attachments), or by the loads being transported. This also includes the area within reach of falling loads or falling / lowering truck attachments.
Especially when entering the rack you must ensure that no persons are located between rack and /load.

Unauthorised persons must be asked to leave the danger area. The driver must give a warning signal whenever a situation presenting danger to persons might develop. The fork lift truck must immediately be brought to a standstill if persons, although asked, do not leave the danger area.

Safety devices and warning labels: The safety devices, warning labels and warning notes described in the present operating instructions must always be heeded.

Rack: The vehicle is exclusively designed for operation with the Jungheinrich IPC rack and must be operated within it and with protective fences (up to 2.5 m high) mounted only. In particular, pay attention to correct installation of safety devices, see section 4.13 (mechanical stops, deflection and drive-in plates).

Load protection: Depending of the load type a suitable load protection is required to prevent the load (e. g. boxes) from falling down from the pallet. It is prohibited to transport loose goods - Danger of falling down items!

Safety sensors: The safety-relevant sensors B1 (channel end) and B11 (guide rail detection) must be checked regularly.

2 Description of operating and display elementst

Item	Control / Display	IPC	Function
1	Hand terminal	●	
2	Display screen	●	Displays operating status and parameters
3	**READY** indicator (green)	●	Load carriage ready
4	**RUN** indicator (yellow)	●	Driver prompts
5	START **button**	●	Starts a travel command
6	REVERSE **button**	●	Load carriage reverses slowly
7	RESET **button**	●	Stops the IPC load carriage, deletes the current travel command, powers down and restarts the truck computer, followed by a “Ready” display (approx. 4 seconds).
8	I / O button	●	Switches the control current for the hand terminal on/off
9	**ERROR** indicator (red)	●	Error Display Optional: text message on display screen
10	Docking station	●	Power supply (charging) and bracket for hand terminal
11	Locking adjuster	●	Adjusts the fixed position of the hand terminal on the docking station
12	Battery lock	●	Pull it up to loosen the battery container
13	Lock hook	●	Locks the load carriage to the truck
14	Charge indicator LED	●	Indicates the battery charge status (see Chapter D).
15	Charging connector / on-board charger (with safety switch)	●	The battery is charged when the mains connector is inserted into a 230 volt mains socket.
16	Key switch	●	Switches control current on and off. Removing the key prevents the truck from being switched on by unauthorised personnel.
17	SHIFT **key**	–	Press this together with a digit to select the truck
18	Green indicator	●	Indicates the docked status
19	Beacon	●	Beacon active when drive motor active
20	Emergency Stop	●	Emergency Stop switches the IPC off

● = Standard equipment ○ = Optional equipment

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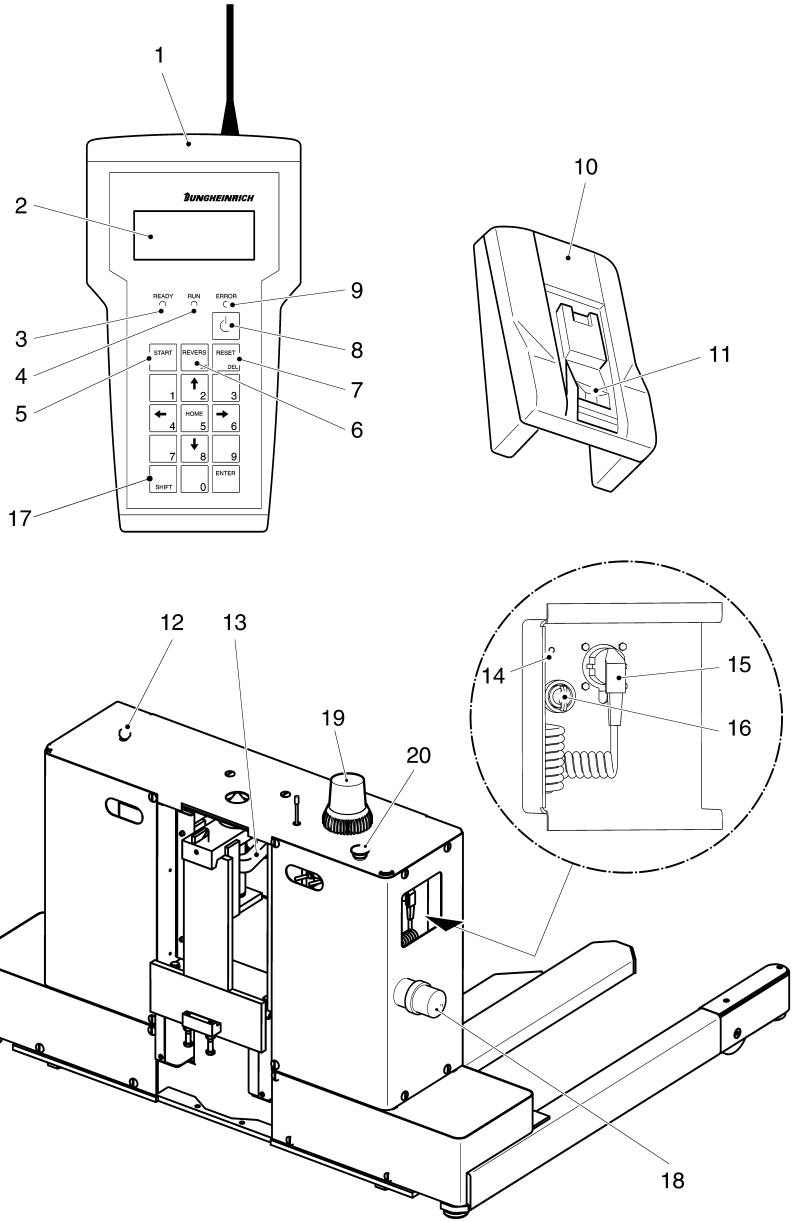
1
2
3
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12
13
14
15
16
17
18
19
20
JUNGHEINRICH
READY
RUN
ERROR
START
REVERS
RESET
DEL
HOME
SHIFT
ENTER

3 Starting up the truck

Before starting or operating the truck, or before lifting any loads, the driver has to make sure that nobody is within the danger area.

Checks and operations to be performed before starting daily work:

– Check entire truck (especially wheels and load carriage) for damages.

– Check that the receptacle cone and receptacle plate are well lubricated and lubricate if required (see chapter C 3).

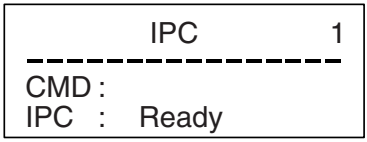
3.1 Switching on the truck:

– Check whether the charging plug (15) is plugged in.
– Insert the key into the key switch (16) and turn it clockwise to the stop.
– Check whether the locking hook (13) is open.

3.2 Preparing the lift truck:

– Check whether the locating coupling has been correctly mounted (refer to chapter C)
– Switch on the lift truck (refer to operating instructions of the lift truck)
– Switch on the hand operating unit.

The display shows the basic menu with the message:



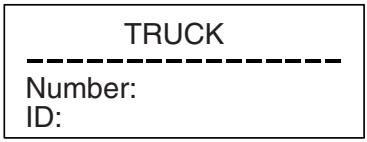
Green LED lights up

Lift truck and IPC are now ready for operation.

3.3 Selecting the load carriage:

Up to 10 different IPC load carriages on a truck can be operated by a hand terminal. Enter the truck number to make the selection.

– Scroll to the right three times using the ➞ key.



Select number with ⬆ or ⬇ key and confirm with **ENTER**

You can also select (and more quickly) by using [Shift] + [n],
n = truck number (1 to 0 (=10)).

4 Operating the industrial truck (IPC load carriage)

4.1 Safety regulations applicable when operating the truck

Driving lanes and work areas: Only such lanes and routes that are specially allocated for truck traffic must be used. Unauthorized persons must stay away from work areas. Loads must only be stored at places specially provided for this purpose.

Driving conduct: Do not carry passengers or lift other people. The truck must be driven at slow speed when negotiating bends or narrow passages, when passing through swing doors and at blind spots. The driver must always observe an adequate braking distance between the fork lift truck and the vehicle in front and he must be in control of his truck at all times. Sudden stopping (except in emergencies), rapid U-turns and overtaking at dangerous or blind spots is not permitted. It is forbidden to lean out of or reach beyond the working and operating area.

Visibility: The driver must look in the direction of travel and must always have a clear view of the route ahead. When loads blocking the view are carried, the fork lift truck must be driven with the load at the rear. If this is not possible, a second person must walk in front of the fork lift truck to give suitable warnings.

Negotiating slopes and inclines: Negotiating of slopes and inclines is permitted only when they are recognised lanes, when they are clean and non-slipping, and when the technical specification of the truck permits safe driving on such slopes or inclines. Loads must always be carried at that end of the truck facing uphill. U-turns, cutting obliquely over slopes or inclines and parking of the fork lift truck on slopes or inclines is not permitted. Inclines must only be negotiated at slow speed, with the driver ready to brake at any moment.

Use of lifts and driving on loading platforms: Lifts and loading platforms must only be used if they are of adequate load bearing capacity, if suitable for driving on, and if authorised by the user of the truck for truck traffic. The fork lift truck driver has to satisfy himself accordingly before driving into lifts or on to loading platforms. The truck must enter lifts with the load in front and must take up a position which does not allow it to come into contact with the walls of the lift shaft.
Persons riding in the lift together with the fork lift truck must only enter the lift after the fork lift truck has come safely to a standstill, and must leave the lift before the fork lift truck.

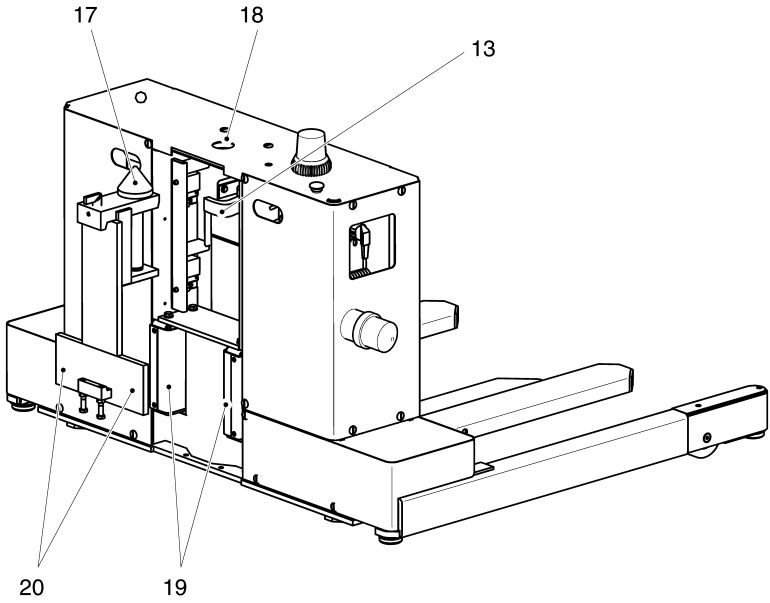
Nature of loads to be carried: The operator must make sure that the load is in a satisfactory condition. Only carry loads that are positioned safely and carefully. Use suitable precautions, e.g. a load guard, to prevent parts of the load from tipping or falling down.

⚠ **Towing of trailers with mounted** load carriage **is not allowed!**

4.2 Picking up the device

The IPC has been designed for use at different fork lift truck types. Therefore, the operation of the lift truck itself (with respect to position and handling of the truck operating elements) cannot be explained in detail. Refer to the operating instructions of the corresponding lift truck.

– The device is switched on and ready for operation (refer to section 3)
– Drive the lift truck towards the device so that the locating cone (17) is positioned some centimeters below the cone hole of the support plate (18). If required, correct the lateral position by means of the side-shift.



– The lower centering pieces (20) are inserted into the wearing plates (19).
– Slowly lift the mast. The locking hook (13) automatically closes when the cone (17) is fully seated in the hole (lifting point).

The following response is shown at the hand operating unit:

IPC 1
CMD :
IPC : Docked

Display message
Green and yellow LEDs are flashing

The green indicator is lit.

4.3 Travelling

During travel the load carriage must never touch the ground!

When placed on the ground the IPC load carriage stands on the load wheels and on skids on the drive side, so that the drive wheels are clear of the ground.

- Only travel with the covering closed and the battery correctly locked.
- Never put the load carriage down on the ground and tow at the locking hook.
- Observe the larger swivelling radius with attached IPC.
- For travelling instructions, refer to the operating instructions of the corresponding lift truck.

4.4 Picking up a pallet from the ground

- Set mast or fork tilt to neutral (home position).
- Lower mast and slowly drive into the pallet until it makes contact with the fork limit stop. The IPC load carriage must be lifted clear of the ground.
- The pallet must be positioned approximately 3 cm further back than the wheel arm tips.
- Lift the pallet.

4.5 Stacking a pallet

4.5.1 Introducing and removing the IPC load carriage to the pallet channel (in channel: automatic mode) [not: for stacking the last pallet in the channel]

Do not operate the IPC pallet channel with more than one IPC load carriage. The owner must take organisational measures to ensure this does not happen.

- Travel to the desired channel.
- Compare the truck number (1, 2, .., n) on the IPC load carriage with the display on the hand terminal (top right of display). If they differ, select the right truck number, see section 3.3.
- Adjust the lifting height in such a way that the load carriage has a free lift of approximately 5 cm as opposed to the rack. Attach indicators on the lifting mast or use the (optional) height preselection according to the truck's scope of delivery if applicable.
- Extend mast and approach the rack at right angles up to the approaching aid (optional). If required, correct the lateral stacking position by means of the side-shift.
- Correct mast inclination (“great lifting height”) by tilting mast or fork backward.
- The load carriage must be fully within the rack contour, i.e. the load carriage flush with the guide rail.
- Lower the truck coupling (cone) further down, a further 10 cm from the load carriage attachment point, until the display appears and an audible signal (beep) is heard. Stop lowering.

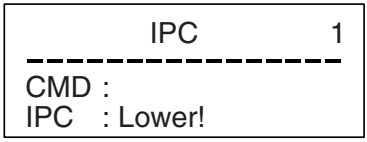
Press **START** at the hand operating unit – the lock opens.

IPC 1
CMD :
IPC : Put down

Display message
Green and yellow LEDs are flashing

The green indicator goes out

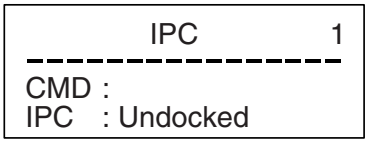
Lowering: The message changes as soon as the load carriage detects the guide rail and the cone is free:



Display message
Green and yellow LEDs are flashing

– Continue to lower (from the contact point of the load carriage some 10 cm more)

An acoustic signal (beep) is heard when lowered low enough:



Display message
Yellow LED lights up

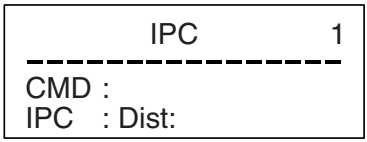
– Load carriage automatically enters the channel. Beacon active while truck is moving.

If the load carriage is set down with lateral pressure when manoeuvring in the channel, the mast springs back accordingly when the load carriage is set down. This may cause lower sensor "**B3 load carriage decoupled"** to be unoccupied, and the load carriage does not move. The message "Unoccupied" and the beep are missing. In this case you must actuate the side-shift (in most cases to the left). As soon as the coupling is positioned roughly in the IPC channel centre, the load carriage drives into the channel. Without correction the load carriage may fail to correctly track in upon return.
It may happen that the lower sensor **"B3-load carriage decoupled"** is not occupied in case of high loads or great lifting heights (mast deflection), and the load carrier may fail to start. Correct by tilting the mast or fork backward first until the load carrier can be deposited in horizontal position. Please note: Tilt back to the neutral position before docking the load carrier again.
The load carrier can be started in any case by pressing the START key if it should not start in spite of this.

The locking mechanisms can only be opened in docked condition. Lift the load carriage free for about 5 cm and set down again after having pressed the **START** key if the **START** key was not pressed prior to lowering of the load carriage.

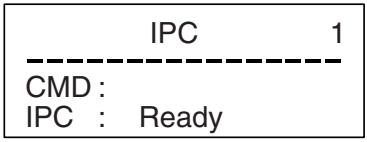
The lock will close again if the load carriagefails to detect the rack rail within ca. 5 to 8 seconds after the lock was opened (e.g. in case the **START** key was inadvertently pressed).

– The load carriage moves the pallet to the next available space at the back and then lowers it automatically with a gap of approx. 5 cm



Display message
Yellow LED lights up
Travelling distance in mm

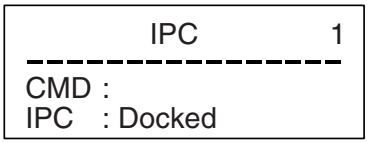
– load carriage travel back to the channel start.



Display message

– If the truck is still in the starting position in front of the channel: raise the mast until the load carriage has been raised approx. 5 cm. Otherwise: Reposition the truck before the IPC load carriage to be collected.

The locking mechanism closes automatically.



Display message
Green LED lights up
Signal tone

– Check the display until the “Docked” message appears.
– The green indicator is lit
– Slowly move the truck and the IPC load carriage out of the channel and lower the mast.

STOP **Stop:** First check that “Docking” is displayed and the green indicator is lit, then take the load carriage out of the channel. The “Docked” message indicates there is a physically secure connection between the truck and the load carriage.

→ Once the IPC load carriage has been introduced to the pallet channel the truck can carry out another job.

STOP **Stop:** First check that “IPC: Free” is displayed, then move the truck back from the rack or retract the mast. The “Free” message indicates that there is no mechanically secure connection between the truck and the load carriage. The green indicator must not be lit.

→ If the load carriage is lowered with lateral pressure on introduction to the channel, the mast correspondingly springs back when the load carriage is lowered. This can cause the lower sensor B3 (load carriage uncoupled) not to be applied, and the load carriage will not move. There is no “Free” message and no beep. In this case apply the sideshift (generally to the left). As soon as the coupling is roughly centrally aligned with the IPC channel, the load carriage enters the channel. Without the adjustment the load carriage may not align correctly on return.

This action may not be sufficient with heavy loads or at high lift heights (mast deflection). In this case correct the mast backward tilt or fork forward tilt until the load carriage can be lowered horizontally. Note: take into account the fact that the empty mast will spring back, i.e. before the load carriage comes back restore the tilt to the neutral position. With some ETV trucks the forks can be set horizontally by pressing a button (optional, fork tilt only).

If the load carriage still fails to move, it can be started at any rate by pressing START.

The lock can only be opened when the carriage is docked. If you forget to press START before lowering (the lock remains closed), lift the load carriage again by approx. 5 cm and press START before lowering again.

After opening the lock (START button) the load carriage must be lowered within approx. 8 seconds and the coupling lowered, otherwise the lock will close again, (safety time window, e.g. if the **START** button is accidentally pressed).

If when the IPC load carriage is lowered and the truck coupling is subsequently lowered, no “Free” message appears (no beep and lock closed), the truck number in the display may be wrong. Select the correct truck number (section 3.3) and raise and lower the IPC load carriage again.

With heavy loads or large lift heights, after the load carriage has been lowered in the rack the discharged mast can spring back so far that the coupling cone can no longer find the receptacle when raised again (outside the catchment area). To ensure better docking on the load carriage the truck should be moved slightly nearer to the rack or the mast/fork tilt moved forward.

Failure to make this adjustment will result in excess wear to the coupling cone and the receptacle plate. The slightly raised load carriage rolls back into the rack and the top of the cone rubs on the deflector bevel at great pressure. This blunts the top and causes grooving on the receptacle plate.

With this adjustment the operator can avoid excessive wear. It also ensures uninterrupted work processes (by taking preventative measures).

4.5.2 Stacking the furthermost pallet in the channel [manual mode]

The furthermost pallet of a channel is brought in by simply lowering the IPC load carriage including the pallet. Lower the fork until it is free once the pallet has been deposited and pull out the fork by either retracting the mast or backing the lift truck.

Make sure not to press the START button during this process.

The IPC load carriage is only introduced to the channel as far as the rear edge of the pallet, the drive section remains outside the rack block. Otherwise, safety devices on the IPC load carriage of the rack system may be damaged.

4.6 Retrieving a pallet

- The load carriage automatically recognises the loading condition.
- The procedure is the same as for stacking, however the load carriage must be set into the channel without load.
- The load carriage travels to the next pallet into the channel, lifts it up, and returns.
- Pick up the load carriage.
- The lock closes automatically. Green indicator is lit.
- Remove the load carriage from the rack.
- The load carriage lowers the forks after approx. 2 seconds.
- Place the pallet on the ground.

4.6.1 Introducing and removing the IPC load carriage to the pallet channel (in channel: automatic mode) [not for retrieving the furthermost pallet in the channel]

⚠ Do not operate the IPC pallet channel with more than one IPC load carriage. The owner must take organisational measures to ensure this does not happen.

- Same procedure as for stacking, but place unladen load carriage in the channel, the charge status is automatically identified.
- The load carriage goes as far as the last stored pallet in the channel, raises it and returns.
- Connect the load carriage again at the start of the channel and using the truck lift it clear by approx. 5 cm with the truck.
- The lock closes automatically.
- Green indicator is lit.
- Check the display until the “Docked” message appears.
- Remove the load carriage from the rack by reversing the truck or retracting the mast.
- The load carriage lowers the forks after approx. 2 seconds.
- Place the pallet on the ground, the IPC load carriage should remain clear of the ground.

STOP Stop: First check that “Docking” is displayed and the green indicator is lit, then take the load carriage out of the channel. The “Docked” message indicates there is a physically secure connection between the truck and the load carriage.

➔ Once the IPC load carriage has been introduced to the pallet channel the truck can carry out another job.

STOP Stop: First check that “IPC: Free” is displayed, then move the truck back from the rack or retract the mast. The “Free” message indicates that there is no mechanically secure connection between the truck and the load carriage. The green indicator should not be lit.

⚠ Under no circumstances should you move the lowered IPC load carriage along the ground and do not attempt cornering. Any movement at an angle to the direction of turn could damage the wheels.

4.6.2 Retrieving the furthermost pallet in the channel [manual mode]

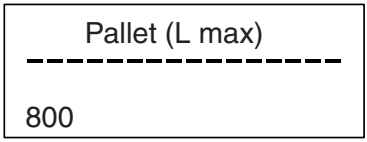
- Enter the forks of the IPC load carriage in the front pallet and lift it clear. Retrieve the pallet from the pallet channel by retracting the mast or reversing the truck.

➔ The IPC is used in this instance only as a load handler.

4.7 Adjusting the pallet stop (option)

If you are using different pallet formats (IPC type P5) the pallet type can be set as follows:

– Adjust the stop rail on the fork to the desired measure, allow the locking bolts to latch.
– Set the pallet length on the hand operating unit; to do so, press the ← key once to the left.



Select pallet size with ↑ or ↓ key and confirm with **ENTER**

Attention Possible error:

If the push stop remains in the rear position, the smaller pallet format will be collected too far on the fork shank an will be placed in the channel too far away from other stored pallets (loss of pallet space).
If the push stop is always in the front position, the larger pallet format will be collected too far on the fork tip, the load centre of gravity will be excessively high and will overload the IPC load carriage. This is not a suitable load condition and should be avoided.

If agreed during the project planning (IPC order sheet enclosed) up to 3 different pallet positions may appear. The available stacking depths “800”, “1000”, “1200” can be assigned to the corresponding pallet formats.

4.8 Stacking and Retrieving Pallets on Contact

Normally, pallets in the pallet channel are stacked at a distance to each other. If agreed during the project planning, stacking by contact may also be applied.

On stacking the IPC load carriage travels at crawl speed after braking until it is stopped by a positioned pallet. The controller identifies this as the depositing position, lowers and returns to the start of the channel. This operating mode is used especially with pallets with a large overhang.

Requirements:

– the load can withstand minor impacts and vertical movement (free lifting, lowering). smooth load edge on contact surface, no protruding edges.
– Pallet weight at least 200 kg (resistance against moving away)

On retrieval the pallet is collected with a suitable mechanical stop.

4.9 Disconnecting the IPC load carriage from the truck – safe parking

4.9.1 Parking in the rack:

– Drive the truck into the rack
– Lower mast until the guide rail is touched
– Press the START key
– The lock hook goes up, green indicator goes out
– The locking hook opens
– Press the RESET button (prevents the truck from receiving a start command while lowering).
– Lower the mast until the cone is visibly free
– Reset the truck

4.9.2 Parking on the ground:

– Full extend the side shift
– Lower the mast until the IPC load carriage is placed on the ground
– Press the START key
– The lock hook goes up, green indicator goes out
– The locking hook opens
– Lower the mast until the cone is clearly free (no beep)
– Reset the truck

Switch off the device (key switch) and connect it to a charger if necessary (see sections D 4 and 5) after having separated the IPC load carriage from the fork lift truck.

4.10 Status and request messages

Display	Meaning
IPC: Ready	The IPC load carriage has returned to the start of the channel and is ready for docking (coupling) onto the truck.
IPC: Docked and green indicator is lit	The IPC load carriage is securely connected to the truck, the coupling cone is fixed in its receptacle and the mechanical lock is closed. **Only in this condition** may the IPC load carriage be moved out of the rack.
IPC: Reverse	Reverse mode activated with REVERSE button. IPC load carriage reverses slowly, e.g. for troubleshooting.
IPC: Depositing	Request to deposit the IPC load carriage onto the IPC rail by lowering with the truck.
IPC: Lower!	When the IPC load carriage has been deposited you are prompted to continue lowering the IPC coupling until the cone is free (beep).
IPC: Distance: 12345	Distance covered in the rack (in mm, rack depth). The distance covered in the IPC channel is permanently displayed, forward and back. The maximum distance (pallet position) remains stored until the next travel command (START), can be selected by pressing a key ([shift]+[F0]).
IPC: Free	IPC load carriage is uncoupled (free) of the truck. When the IPC coupling has been deposited and lowered the mechanical connection to the truck is completely released. Load carriage travels automatically into the channel. **Only in this condition** may the truck be moved away from the rack.

Display	Meaning
IPC: Unlock!	Prompt to open the lock. Usually this means “START” was not pressed beforehand. Raise IPC load carriage again carefully, press “START” and then start the “Depositing/Lowering” process.
IPC: Charge battery	The IPC load carriage battery is discharged. The charge level has fallen below 20%, the truck controller does not accept further travel commands. However the IPC returns to the start of the channel.
IPC: Channel end!	The channel end has been identified. The IPC load carriage had entered the channel to retrieve and did not find any pallets. IPC returns to start of channel.
IPC: Lag!	Reverse travel addition activated. When reversing to the start of the channel the IPC load carriage stops before the docking position and continues travelling at crawl speed up to the truck coupling or the IPC rail mechanical stop (defined docking position).

4.11 IPC spare fork instructions

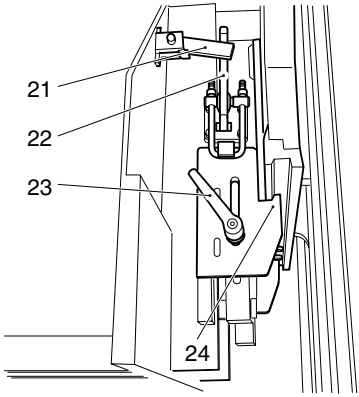
(assembly status: ETV coupling)

The spare fork is used for occasionally handling pallets not raised with the IPC, e.g. on a pallet rack.

STOP Check the spare fork for damage before using it. Replace any damaged parts immediately.

⚠ The IPC spare fork must only be used by trained personnel.

For provide for operation with an ETV coupling both hooked tie plates must be fitted with the clamping lever, power stretcher and catch in the upper position, for operation with an EFG coupling these parts must be in the lower position.



– Lift up the catch (21, red)

– Slightly loosen the clamping lever (23, red)

– Move the power stretcher (22, black) down to loosen it.

Raise the spare fork with the receptacle cone of the truck coupling.

Using the power stretcher raise the hooked tie plate on both sides so that the lugs (24) securely lock into the FEM fork carriage.

The power stretcher must be set so that the hooked tie plate is fixed and the power stretcher’s dead centre has been overcome.

– Tighten the clamping lever.

– Lift down the top catch.

Check the locking lug overhang (min. height overhang 8 mm).

STOP Check that the spare fork is correctly located on the cone. The lower lock should engage correctly. The spare fork must be securely locked onto the FEM carriage.

4.12 Quick reference card

The laminated quick reference card comes with every IPC load carriage and must be visibly fastened at the truck's operator station.

Quick start guide	**IPC**	
Driver action	**Shuttle response**	***Hand terminal display***
Switch on IPC shuttle		
Switch on hand terminal		***"Ready"***
Lift shuttle	Lock closes	***"Docked"*** ***Green indicator is lit.***
Approach rack channel	Lock closed	***"Docked"*** ***Green indicator is lit.***
Shuttle in channel, raised 5 cm **Press "START"**	Lock opens for approx. 8 seconds	***"Deposit"***
Lower mast / deposit shuttle		***"Lower"***
When lowered far enough: **Cancel "Lower"**	Shuttle sets off	***"Free"*** (+ beep) ***Green indicator goes out***
Shuttle travels in channel		(route indicator)
Shuttle is back, truck coupling in correct position		***"Ready"***
Raise mast / lift shuttle	Lock closes Green indicator is lit	***"Docked"*** (+ beep)
Pull shuttle out of rack	Green indicator is lit	***"Docked"***
➔ Attention: Operation by authorised personnel only		

⚠ Only when “Docked” is displayed and the green indicator is lit can the IPC load carriage be removed from the channel.

4.13 Operating instructions for the Jungheinrich IPC rack

For the operation of IPC racks, the guidelines and safety regulations of the associations for warehouse equipment and machinery BGR 234 (previously: ZH 1/428), and the guidelines for the safe use of secure racking in accordance with FEM 10.2.04 are binding for the user. This also applies to the following stipulations. Breach or non-observance of the above will render the Jungheinrich warranty void. The following sections in particular cover correct handling of the rack. (Some of these topics have been covered before.)

Instructions for Introducing the IPC Load Carriage to the Rack

The freely movable carrier truck with the IPC load carriage and pallet picked up positions at right angles to the rack face with its longitudinal axis. Position the truck's load-bearing wheels against the approaching aid where such an aid has been installed on the ground. This ensures a rectangular position to the rack. Actuate the side-shifting device to readjust the lateral IPC load carriage positions in relation to the channel entry.

⚠ When entering the pallet channel, the lift of the carrying truck must provide for an excess lift of at least 30 mm between the wheels of the IPC load carriage or the bottom face of the pallet and the IPC rail while the IPC load carriage is pushed into the channel.

⚠ Lifting the IPC load carriage too high results in the wheel arms being positioned above the entry plates. The centring device is disabled, the IPC load carriage cannot be inserted in a controlled manner. There is a risk that the load wheels will be damaged by the edges of the entry plates.

⚠ On the lower rack levels the driver’s view of the IPC load carriage outriggers can be hindered, e.g. by loads overhanging the side. Special attention is required, otherwise the entry plates will be considerably damaged.

⚠ Issue the START command on the IPC hand operating unit only when the IPC load carriage has fully vanished in the rack contour. The IPC load carriage rear edge is then flush with the IPC rail front edge. The load carriage must not be moved further into the channel as pallets lying there could be moved and truck components damaged. For further procedures see chapter 4.3.

When lowering the last pallet in the channel, only the pallet, not the IPC load carriage will rest on the IPC rail.

The carrier truck may either wait in front of the rack with the mast lifted, or, when it is to handle several IPC load carriages, execute another task while the IPC load carriage moving inside the rack is automatically performing its assignment.

IPC rack safety devices

The IPC rails feature mechanical safety stops on both sides of the channel. Using a butting piece the IPC load carriage moves between these two stops. During operation, these stops are not touched. The stops prevent the IPC load carriage from dropping out of the rack in case of a controller or sensor failure.

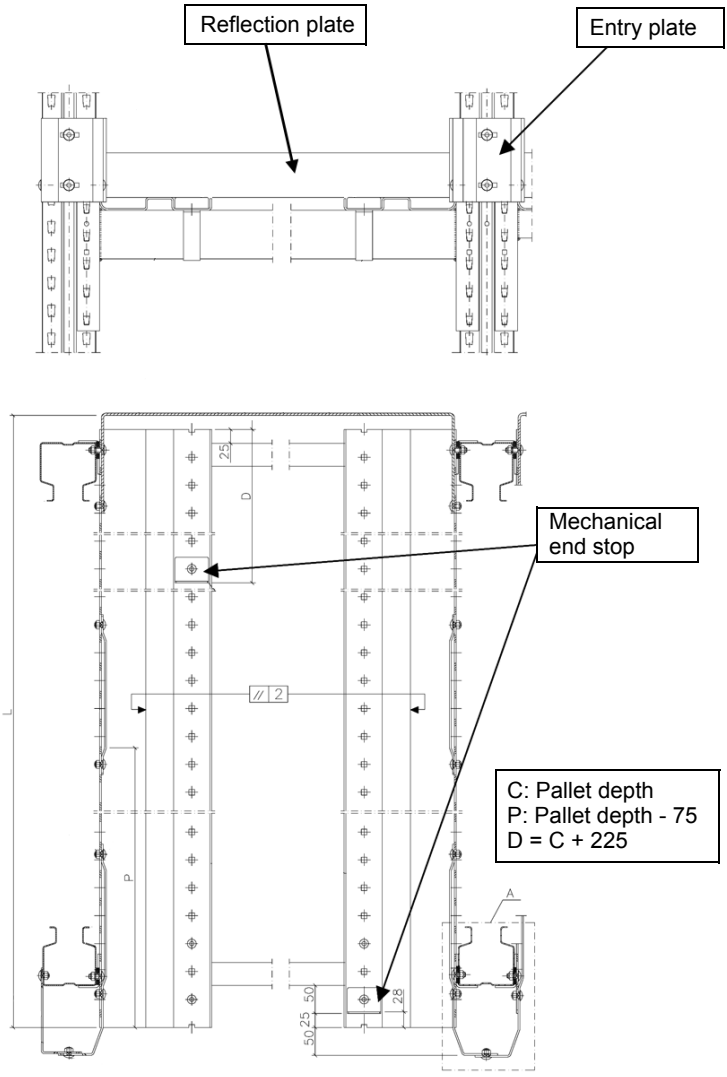
⚠ The mechanical end stops on the IPC rails must be checked regularly for missing parts and for damage. Missing or damaged safety stops must be immediately replaced. Otherwise, the affected channel must be closed.

Reflex plates are fitted to ensure correct stopping process. These are sensed by the infrared light scanners on the IPC load carriage.

⚠ When the reflection plates are bent, a IPC load carriage stop under normal operating conditions is not performed, and the IPC hits against the mechanical stops. This can result in consequential damage and is not the usual operating mode. The reflex plates must be checked at regular intervals.

Safety Regulations for Operating the IPC Rack

The owner must provide clearly visible signs with the wording: “No access to racking for unauthorised personnel”.


Reflection plate
Entry plate
Mechanical
end stop
C: Pallet depth
P: Pallet depth - 75
D = C + 225
25
D
L
P
// 2
A
50
25
50
28

4.14 Jungheinrich IPC rack “FIFO” operating mode (○)

The “FIFO” operating mode (first in first out) allows for storage and retrieval from both sides of the rack. This requires the following changes to be made to both the racking and the IPC load carriage.

On the IPC racking

– The rails are fitted with four mechanical stops
– Instead of the reflection plates, magnets are fitted onto retaining plates at the ends of the channel

On the IPC load carriage

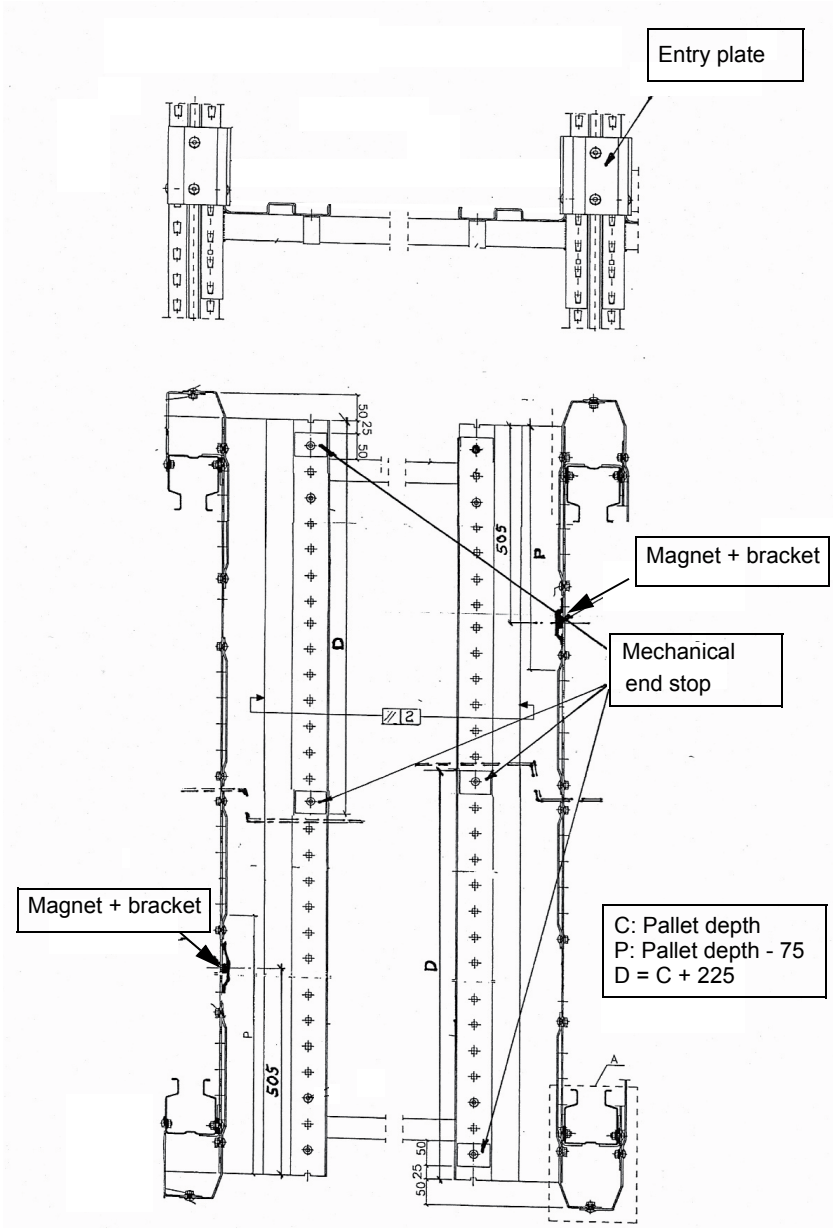
– Magnet switch mounted on the right outrigger (seen in the fork direction)
– Mechanical stop below the chassis only on the right hand side (seen in the fork direction)

⚠ Do not operate the IPC pallet channel with more than one IPC load carriage. The owner must take organisational measures to ensure this does not happen.

⚠ The mechanical end stops on the IPC rails must be checked regularly for missing parts and for damage. Replace any missing or damaged end stops. Otherwise, block the affected channel for use.

Magnetic plates are fitted to ensure the correct stopping process. These are sensed by the magnetic switch on the IPC load carriage.

⚠ If any magnetic plates are missing, the IPC will not stop correctly and the IPC will strike the mechanical end stops. This can result in consequential damage and is not the correct operating mode. The magnetic plates must be checked at regular intervals.


Entry plate
Magnet + bracket
Mechanical
end stop
Magnet + bracket
C: Pallet depth
P: Pallet depth - 75
D = C + 225
505
D
P
50
25
50
A

4.15 Rescuing a IPC truck from the channel (IPC load carriage)

⚠ Two trained and authorised personnel are required to rescue a IPC truck. The IPC rescue truck must only be used in conjunction with a IPC carrier truck (IPC truck), equipped with a IPC coupling.

A non-functioning IPC load carriage in the pallet channel is removed from the channel with the aid of the IPC rescue truck (option), a cable winch and steel cable. The rescue truck has a mesh protection that can be adapted to the height of the channel.

– Lower the IPC coupling onto the fork carriage with the forklift truck. To do this you may have to move the forklift back.
– Attach the rescue truck to the receptacle cone of the forklift coupling.
– Insert the retaining pin and secure it.
– Deposit IPC load carriage hand operating unit into the recovery trolley (operation from the lift truck is not possible).

STOP The rescue person must be satisfied that the rescue truck is securely fitted to the cone and that the retaining pin has been inserted and is also secure.
The rescue person must wear a hard hat. The rescue truck entry door must be closed and locked.
The rescue person must hold onto the railing of the rescue truck during lifting and lowering, must not leave it and should not lean out of the railing of the rescue truck.
The forklift truck operator must not leave the truck during the rescue.
The two persons must communicate by calling out to each other.

– Raise the rescue truck and the rescue person to channel height and place it on the rails in the IPC channel.
– Undo the retaining pin and call out to the forklift driver to lower approx. 100 mm. The rescue truck is now separate from the forklift.
– The rescue person moves the rescue truck to the IPC load carriage. Through sheer muscle strength he pulls on the rack beams and in this way moves the rescue truck forward. The rescue person can knee or sit in the rescue truck, depending on the channel height.

STOP The radio control must not be applied during rescue.

– Switch off the IPC load carriage (key switch, on the right hand side of the IPC load carriage).
– Insert the tow cable into the IPC load carriage by inserting the karabiner hook at the cable end into the attachment eye (on the base plate in front of the centre panel).
– Prepare the cable winch so that the cable can be unwound.
– Move the rescue truck back to the start of the channel and unwind the cable at the same time.
– Couple the rescue truck to the forklift. To do this, call out to the truck driver to raise by approx. 100 mm. Secure the rescue truck with a retaining pin. The rescue truck is now connected to the forklift.

STOP The rescue truck operator must be satisfied that the retaining pin is in the correct position before instructing the other person to pull out the rescue truck.

– The rescue person gives the instruction to the truck driver to pull the rescue truck and rescuer out of the channel and to stop before the rack. The cable pulley must be at the same height as the mounting point on the IPC.
– Pull the IPC load carriage to the start of the channel with the cable winch.
– Ask the truck driver to lower the truck by approx. 1m and loosen the karabiner hook of the cable from the IPC load carriage.
– Remove the karabiner hook of the rope from the IPC load carriage
– Attach the truck coupling to the IPC load carriage and drive out of the rack channel completely. Lower carefully! The IPC load carriage lock on the coupling is not closed.

There must be nobody present in the hazardous area when the IPC load carriage is being lowered.

F Maintenance of the fork lift truck

1 Operational safety and environmental protection

The checks and servicing operations contained in this chapter must be performed in accordance with the intervals as indicated in the servicing checklists.

STOP Modifications of fork lift truck assemblies, especially of the safety installations, are not permitted. On no account must the operational speeds of the truck be changed.

⚠ Only original spare parts have been certified by our quality assurance service. To ensure safe and reliable operation of the fork lift truck, only spare parts of the manufacturer must be used. Used parts, oils and fuels must be disposed of in accordance with the applicable environmental protection regulations. For oil changes, the oil service of the manufacturer is available to you.

Upon completion of any checking and servicing activities, the operations contained in the section “Recommissioning” must be performed (refer to chapter F).

2 Safety regulations applicable to truck maintenance

Servicing and maintenance personnel: The fork lift truck must only be serviced and maintained by trained personnel of the manufacturer. The service organization of the manufacturer has external technicians trained especially for these assignments. We thus recommend signing a maintenance contract with the relevant service location of the manufacturer.

Lifting and jacking up: When a fork lift truck is to be lifted, the lifting gear must only be secured to the points specially provided for this purpose. When the truck is to be jacked up, suitable measures must be taken to prevent the truck from slipping or tipping over (use of wedges, wooden blocks). Work underneath the raised load lifting device must only be carried out when the fork is immobilised and supported by a chain of adequate strength.

Cleaning operations: No inflammable liquids must be used when cleaning the fork lift truck. Prior to commencing cleaning operations, all safety measures that are required to prevent sparking (e.g. by short-circuits) have to be taken. For battery-operated fork lift trucks, the battery plug must be removed. Only weak indraft, weak compressed air and non-conducting, antistatic brushes must be used for the cleaning of electric or electronic assemblies.

⚠ If the fork lift truck is to be cleaned using a water jet or a high-pressure cleaner, all electric and electronic components must be carefully covered beforehand because moisture can lead to incorrect functioning.
Cleaning by means of a steam jet is not permitted.

Upon completion of cleaning work, the operations detailed in the section “Recommissioning” must be performed.

Work on the electric system: Work on the electric system of the truck must only be performed by personnel specially trained for such operations. Before commencing any work on the electric system, all measures required to prevent electric shocks have to be taken. For battery-operated fork lift trucks, the truck must also be depowered by removing the battery plug.

Welding operations: To prevent any damage to electric or electronic components, these have to be removed from the fork lift truck before any welding operations are undertaken.

Settings: When repairing or replacing hydraulic, electric or electronic components or assemblies, all truck-specific settings have to be retained.

Tyres: The quality of the tyres greatly affects the stability and the driving behaviour of the fork-lift truck. The factory-mounted tyres must only be replaced by original spare parts of the manufacturer, since otherwise the specification of the data sheet cannot be met. When replacing wheels or tyres, it must be ensured that the fork-lift truck remains level (tyres and wheels must always be replaced in pairs, i.e. left and right together).

3 Servicing and inspection

3.1 Wartungs-Checkliste

Thorough and expert servicing is one of the most important requirements for the safe operation of the industrial truck. Failure to perform regular servicing can lead to truck failure and poses a potential hazard to personnel and equipment.

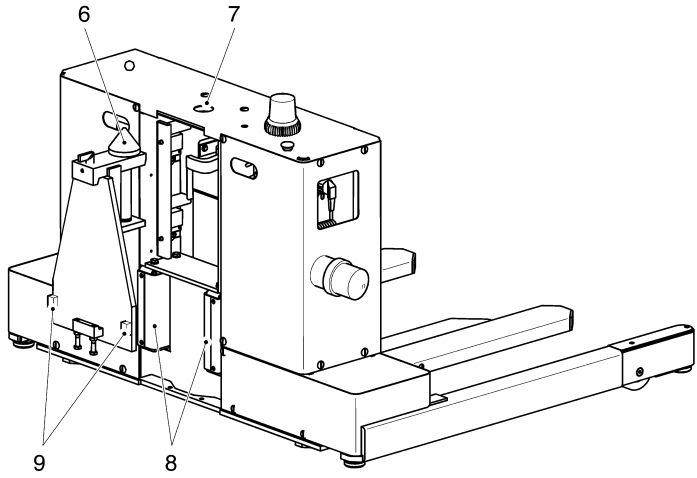
Chassis/superstructure:	Check all load bearing elements for damage
	Check all bolted connections
	Check skids under the drive axle for wear and damage. Skid height: 28 mm (-2 mm)
	Check side guide rollers for wear and damage Width between guide rollers: front (load axle). 1213 mm (+/- 1 mm), rear (drive) : 1208 mm (+/- 2 mm). The skids and guide rollers suffer excess wear if the IPC load carriage is pushed or pulled along the gound, operator error! Always operate the IPC clear of the ground (Chapters 4.3 and 4.4)
IPC coupling (on truck) – receptacle plate	Replace tip of cone if excessively worn. Tip radius, new: R 2 mm. Urgent replacement required if condition:
Receptacle plate (on IPC load carriage)	Replace receptacle plate if considerable signs of grooving present. Urgently required if condition:
Drive:	Check transmission for noise and leaks
	Check for wear and damage
	Check bearing and secure attachment
	Check wheel bolts for tight seat and retighten, if required
Lifting device:	Check function and wear
	Check load section and kinematics for wear and damage

Hydraulic system:	Check performance
	Check hydraulic unit for leaks and damages
Electrical system:	Check function
	Check cables for secure connection and damage
	Check the fuses for correct amperage
	Check the warning devices and safety circuits for correct functioning
Electric motors:	Check the motor for secure attachment
Batteries:	Check the terminals for secure attachment and apply grease
	Check the battery cables for damage, renew, if necessary

In case of special operating and environmental conditions the maintenance intervals must be adapted accordingly.

3.2 Lubrication Schedule

The receptacle cone (6) and the centring pieces (9) of the truck coupling or the receptacle plate (7) and the wear plates (8) on the load carriage must be lubricated at regular intervals. The multi-purpose grease (material no. 14038650) is suitable for this. Alternatively a good adhering Molykote grease (material no. 29201270) can be used.



4 Notes on maintenance

4.1 Preparing the truck for servicing and maintenance operations

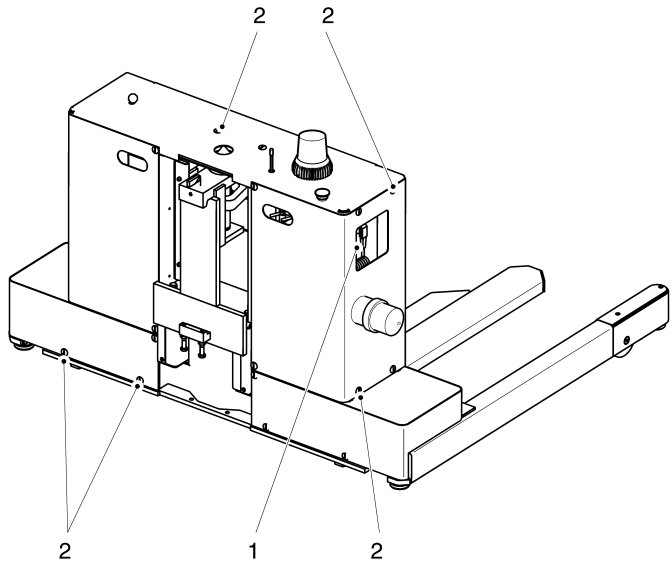
All required safety measures must be taken to prevent any accidents in the course of the servicing and maintenance operations. The following prerequisites must be established:

– Park and lock the truck (refer to chapter E).
– Switch off the truck at the key switch (1).

STOP When working under a raised lift truck, secure it to prevent it from tipping or sliding away. When lifting the truck, the instructions contained in chapter “Transportation and commissioning” have to be observed.

4.2 Removing front hood and front wall

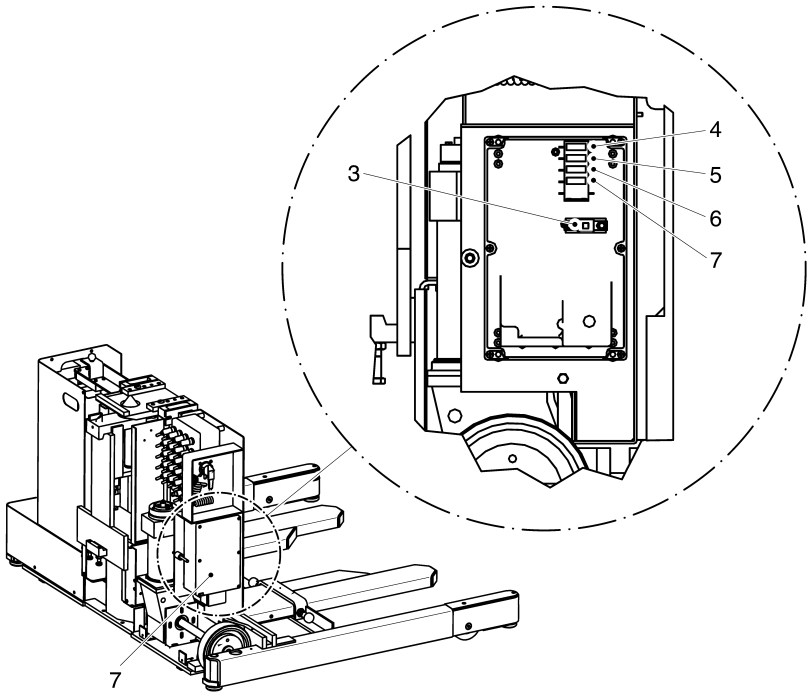
– Loosen lock nuts (2).
– Carefully remove the coverings.



4.3 Checking the electric fuses

– Prepare the truck for servicing and maintenance works (refer to section 4.1).
– Remove coverings (refer to section 4.2).
– If required, dismount the cover (7).
– Check all fuses for their correct value according to the table and replace, if required.

For cold store trucks, the fuses are located in an insulated housing together with the drive system drivers.



Item	Description	To protect:	Rating
3	F1	Main fuse	50 A
4	F2	Hydraulic unit / K1	30 A
5	F3	Charger	10 A
6	F4	Controller	5 A
7	F5	Beacon	2 A

4.4 Recommissioning the truck

Recommissioning of the truck following the performance of cleaning or maintenance work is permitted only after the following operation has been performed:

– Self-test of the control system after switching on

5 Decommissioning the truck

If the fork lift truck is to be decommissioned for more than 6 months, it must be parked in a frost-free and dry location and all measures to be taken before, during, and following decommissioning must be performed as detailed below.

⚠ During decommissioning, the fork lift truck must be jacked up, ensuring that the wheels are clear of the ground. Only this will ensure that wheels and wheel bearings do not suffer damage.

5.1 Prior to decommissioning:

– Charge the battery (refer to chapter D).
– Disconnect and clean the battery. Apply pole grease to the battery poles.

➔ In addition to this, all instructions given by the battery supplier must be observed.

– Spray all exposed electrical contacts with a suitable contact spray.

5.2 Measures to be taken during decommissioning

Every 6 months:

– Charge the battery (refer to chapter D).

⚠ Regular recharging of the battery is very important; otherwise, exhaustive depletion of the battery caused by self-discharging would occur. Owing to sulfatisation, this will result in the destruction of the battery.

➔ When permanent trickle-charging is used, it is not necessary to the charge the battery every 6 months as protection against exhaustive discharge.

5.3 Recommissioning the truck after being taken out of service

– Thoroughly clean the truck.
– Clean the battery. Grease the pole screws using pole grease and reconnect the battery.
– Charge the battery (refer to chapter D).
– Check if the hydraulic oil contains condensed water and change, if required.
– Bring the truck into service (refer to chapter E).

STOP Perform several brake tests immediately after recommissioning the truck.

6 Safety checks to be performed at regular intervals and following any untoward incidents

Perform a safety check in accordance with national regulations. Jungheinrich recommends the truck be checked to FEM guideline 4.004. Jungheinrich has a safety department with trained personnel to carry out inspections.

The truck must be inspected at least annually (refer to national regulations) or after any unusual event by a qualified inspector. The inspector must assess the condition of the truck from a standpoint purely concerned with safety aspects, uninfluenced by any company or economic circumstances. The inspector must be adequately informed and experienced to be able to assess the condition of the fork lift truck and the effectiveness of the safety installations based on the technical rules and principles governing the inspection of fork lift trucks.

The inspection must comprise a comprehensive check of the technical condition of the fork lift truck with regard to accident prevention aspects. Apart from this, the fork lift truck must be thoroughly inspected for damage possibly caused by incorrect use of the fork lift truck. The inspection results must be recorded in an inspection report which must be kept available for a period spanning at least the next two inspection intervals.

The user has to ensure that all defects are eliminated without delay.

As visual proof that the fork lift truck has passed the safety inspection, a plaque is affixed to it. This plaque indicates in which month of which year the next test will be due.

7 Fault location and error recognition

7.1 Fault location

Fault	Possible cause	Remedial action
Truck does not move	– Emergency Stop pressed – Battery not charged yet – Plug not in receptacle – Key switch turned off – Battery discharged – Fuse F1/F4 defective	– disconnect 230 V connection – Plug the plug into the receptacle – Switch on the truck – Charge the battery – Check the fuses
Load cannot be lifted	– Truck not ready for operation – Fuse F2 defective – Contactor K1 defective – Load to heavy – Oil level too low	– Perform all remedial actions listed under the fault ”Truck does not move” – Check the fuses – Check according to circuit diagram – Check load – Check oil level and refill, if required
Load cannot be lowered	– Solenoid valve V1 defective – Lifting fork sluggish	– Check according to circuit diagram – Lubricate and loosen, if required
Battery does not charge	– Fuse F3 defective	– Check the fuses

If the fault cannot be eliminated, take the truck out of service and notify the the service organisation.

7.2 Error messages

The IPC controller is in an error condition after an error message (ERROR). Press “RESET” to restore operating status. This restarts the IPC controller, therefore you must wait at least 4 seconds until the next operation can be started.

Display	Meaning	Action
ERR: Receptacle!	The IPC load carriage is not secure on the cone during attachment. Audible and visual warning, permanent beep noise, flashing LED. The load carriage has been raised from the IPC rail without having docked correctly. The coupling cone is not secure in the receptacle plate, the lock is still open.	If necessary push the load carriage back fully into the channel, lower it carefully and attach again to the coupling until the “Docked” message appears on the display. Otherwise: decommission the IPC load carriage and forklift truck and inform the JH service department. Do **not** remove the IPC load carriage from the racking channel. Risk of crashing!
ERR: Unlock!	Error when unlocking the locking hook. The hook was not fully opened within a timeframe. - Mechanical locking hook jamming. Locking motor current control may have applied during excessive kinetic resistance, e.g. forklift coupling lowered first onto the locking hook and then START pressed. - Faulty sensor	Raise IPC load carriage again until “IPC: Docked” appears, then press START and carriage out the “Depositing/Lowering” process. Otherwise: decommission the IPC load carriage and forklift truck and inform the JH service department. Do **not** remove the IPC load carriage from the racking channel. **Risk of crashing**!
ERR: Lock!	Error when locking the locking hook. The hook was not fully closed within a timeframe. - Mechanical locking hook jamming. The locking motor current control may have applied during excessive kinetic resistance, e.g. forklift coupling lowered while locking hook was closing – resulting in blocking. - Faulty sensor	Raise IPC load carriage again until “IPC: Docked” appears, then press START and carriage out the “Depositing/Lowering” process. Otherwise: decommission the IPC load carriage and forklift truck and inform the JH service department. Do **not** remove the IPC load carriage from the racking channel. **Risk of crashing**!

Display	Meaning	Action
ERR: Travel – FWD!	Forward travel error. Drive motor does not move despite being applied. - Truck mechanically blocked, sudden halt, e.g. travel against mechanical stop. - Faulty sensor (incremental transmitter)	Reverse the IPC load carriage back to the start of the channel using the REVERSE function (keep key pressed down). Pull back the IPC load carriage using the rescue truck. Determine the cause.
ERR: Travel - REV!	Reverse travel error. Drive motor does not move despite being applied. - Truck mechanically blocked, sudden halt, e.g. travel against mechanical stop. - Faulty sensor (incremental transmitter)	Pull back the IPC load carriage using the rescue truck. Determine the cause.
ERR: Hyd. lifting!	Hydraulic lift sensor not recognised.	IPC load carriage, notify JH service department.
ERR: Hyd. lowering!	Hydraulic lower sensor not recognised.	IPC load carriage, notify JH service department.
ERR: Travel duration!	Target not reached after given time. - Truck travelling too slow, mechanically hard to manoeuvre (see above “ERR: Travel – FWD!) - Pallet sensor, braking or channel end sensor (outrigger tips) identifies a foreign body and switches to crawl speed. Example: Part of a pallet or shrink wrap hanging off the side.	Reverse the IPC load carriage back to the start of the channel using the REVERSE function (keep key pressed down). or: Pull back the IPC load carriage using the rescue truck. Determine the cause. Otherwise: Decommission the IPC load carriage and notify JH service department.
ERR: Stop sensor!	Stop sensor identified (LH outrigger) without pre-cutout sensor (crawl speed sensor). - Stop sensor may be configured incorrectly, e.g. pallet not not received far enough or excessive pallet overhang. - Crawl speed fails if foremost pallet is faulty, e.g. RH pallet support missing or reflex sheet (channel end) missing - Faulty sensor	Note correct pallet receipt. Check pallet overhang against agreed distance, only use full pallets. Quickly check the sensors with a box in the light beam, the switch status is indicated by LED.

Display	Meaning	Action
ERR: Blocked!	Truck does not move Load wheels stand still, drive rotates however. - This IPC load carriage may be mechanically blocked, e.g. through foreign bodies or an obstacle on the rail or due to faulty rail tracking (too narrow / too wide). - Load wheel sensor monitoring may be faulty	Reverse the IPC load carriage back to the start of the channel using the REVERSE function (keep key pressed down). Otherwise: Pull back the IPC load carriage using the rescue truck. Determine the cause. Decommission the IPC load carriage and notify JH service department.
ERR: Travel&B3!	Sensore B3 (load carriage uncoupled) active, while IPC travels in pallet channel. Sensor control. Stop after 150mm travel distance.	The truck must be recovered via REVERSE. Sensor faulty, decommission the IPC load carriage and notify JH service department.
ERR: Motor temp.	Drive motor overheated. Temperature switch faulty	Allow the truck to cool down before operating it again. Otherwise: Decommission the IPC load carriage and notify JH service department.
ERR: F rail!	No contact with IPC rack rail. - After issuing a travel command (START) the load carriage was not lowered correctly onto the IPC rails. The load carriage may be at an angle on the IPC rails, guide rollers for example not engaged. Possible missing or faulty entry guide plates at channel start. - Faulty rail sensor	Raise IPC load carriage again until “IPC: Docked” appears, then press START and carriage out the “Depositing/Lowering” process. Make sure the truck is at right angles in front of the rack. If the rail sensor is faulty, decommission the IPC load carriage and notify JH service department.
ERR: Rotary transmitter!	Zero or too many rotary transmitter impulses. Sensor control.	Sensor faulty, decommission the IPC load carriage and notify JH service department.
ERR: B3 & B12!	Error sensor B3 and sensor B12 simultaneously active. Sensor control.	Sensor faulty, decommission the IPC load carriage and notify JH service department.

Display	Meaning	Action
ERR: Connection!	No radio connection between IPC controller and radio terminal. - Distance between radio terminal and IPC load carriage too great, i.e. beyond range (from approx. 50 m). - Radio shadow or highly absorbent material on radio path, e.g. fire wall or - radio terminal antenna screened. - Incorrect truck no. / ID set in the radio controller. Load carriage switched off. Emergency Stop applied.	During operation, position truck before pallet channel and if necessary remove radio terminal from docking station and operate outside of the truck. Set correct truck number on radio terminal (E 3.3). Insert key switch. Unlock Emergency Stop.
ERR: Truck ID!	Incorrect or no truck ID (non defined truck ID “000)”.	Get the JH service department to assign the truck and radio terminal correctly.
ERR: Battery!	Battery in radio terminal discharged. Operation possible only with docking station on truck.	Charge radio terminal on docking station (approx. 6 hours), the carrier truck’s power supply must remain on during this period.

8 Final de-commissioning, disposal

Final, proper decommissioning or disposal of the truck must be performed in accordance with the regulations of the country of application. In particular, regulations governing the disposal of batteries, fuels and electronic and electrical systems must be observed.